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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/710,870

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Dennis W. Prather

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4869

30678

7590

04/14/2005

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EXAMINER

LEE, CALVIN

ART UNIT

PAPER NUMBER

2818

DATE MAILED: 04/14/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/710,870

Applicant(s)

PRATHER et al.

Examiner

Lee, Calvin

Art Unit

2818

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 28 February 2005 (Election).
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-11 is/are pending in the application.
- 4a) Of the above claim(s) 11 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 10/29/04.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## OFFICE ACTION

### *Response to Election*

1. The election (without traverse) of claims 1-10, dated Feb. 28, 2005, is acknowledged. Therefore, claim 11 is withdrawn for further consideration.

### *Claim Rejections - 35 U.S.C. § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office Action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-3 and 5-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Lin et al* (US 5,587,342) in view of *Ichikawa et al* (US 6,534,422).

a) *Lin et al* discloses a method for fabricating a flip-chip semiconductor device having plural conductive polymer bumps thereon, comprising the steps of:

- patterning and depositing metallized pads 12 on a substrate 10 [col. 2, ln.41];
- photolithographically forming plural molds 15 on the substrate using a photoresist, wherein the plural molds are in registration with the metallized pads [Fig. 1];
- filling the molds by applying a low viscosity conductive polymer material 30 [Fig. 2 and col. 3];
- baking the whole structure to thicken any remaining conductive polymer material and evaporate any solvent in the conductive polymer layer [col. 4, lns.17-34];
- polishing the conductive polymer layer to remove excess conductive polymer material from a surface of the photoresist [Figs. 3-4 and col. 4, ln.14];
- stripping the molds to reveal the polymer bumps 30 [Fig. 7 and col. 4, ln.38]
- and hardening the plural conductive polymer bumps by temperature curing [col. 4, ln.58].

b) In re claims 2-3, *Lin et al* also discloses, “wet photoresist layer 15 may be a negative or positive resist ... which allow the formation of openings or vias 20 therein” [col. 2, ln.61].

c) In re claims 5 and 7-9, *Lin et al* discloses “curing ... in an oven having a temperature of 120°C-140°C for approximately 5-10 minutes;” “curing would take place at a temperature slightly higher than the solder’s eutectic temperature, which is typically higher than 100°C-350°C” [col. 4]

- d) In re claim 6, *Lin et al* discloses “photoresist stripper is used to remove wet photoresist 15”
- e) In re claim 10, since *Lin et al* discloses, “to form electrical contacts having a width or diameter of 50 microns or less” [col. 2, ln.30], *Lin et al* inherently teaches or suggests a semiconductor device having high aspect ratio.
- f) *Lin et al* suggests dispensing, spreading, or flooding the polymer on the substrate, but not spinning it. Nevertheless, such spinning technique is known in the semiconductor flip-chip art as evidenced by *Ichikawa et al* disclosing, “the conductive polymer is applied in liquid form on the wafer surface using a silk-screen printing process or a spin-on process and then cured” [Abstract].

It would have been obvious to one with ordinary skill in the specific art to modify the polymer fill of *Lin et al* by utilizing a spinning technique for the purpose of uniformly depositing a polymer layer on the preformed photoresist.

- 4. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over *Lin et al* in view of *Ichikawa et al*, as applied to claim 1, and further in view of *Slutz et al* (US 2005/0025973).

*Lin et al* suggests polishing/removing excess polymer using a flat pad 50, but not fine polishing the conductive polymer layer using a grid having a smaller grain size. *Slutz et al* discloses “a polishing pad ... having an average grain size ranging from about 1 to about 15 microns” [¶ 0033-0034]. The examiner notes that it is notorious to use a polishing pad having a smaller grain size for the purpose of obtaining a polished layer having a smoother surface.

#### ***Contact Information***

- 5. Any inquiry concerning this communication from the Examiner should be directed to *Calvin Lee* at (571) 272-1896 on Mondays thru Thursdays 6:30-4:30PM. If attempts to reach the examiner by telephone are unsuccessful, Art Unit 2818's Supervisory Patent Examiner *David Nelms* can be reached at (571) 272-1787. The fax phone number for the organization (where this application is assigned to) is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system at <http://pair-direct.uspto.gov>. Should you have questions on access to the PAIR system, contact the Electronic Business Center at (866) 217-9197.



March 22, 2005

  
David Nelms  
Supervisory Patent Examiner  
Technology Center 2800